

Chapter 4: Environmental Consequences

4.1 Introduction

This chapter evaluates the four alternatives on the basis of environmental consequences (effects or impacts) to the environment described in Chapter 3. This evaluation is conducted in three parts. First, there is a discussion of the effects common to all alternatives. Second, the effects of each alternative are analyzed for each of more than 25 physical, biological, and socioeconomic parameters or concerns. A table at the end of the chapter (Table 33 on page 286) helps compare and contrast these effects. Lastly, the cumulative impacts of the alternatives are discussed.

As described in Chapter 2, four alternatives are being considered. Alternative A, No Action, would maintain the current level of effort on fish and wildlife and habitat management. Public use programs and regulations would remain virtually unchanged. Alternative B, Wildlife Focus, would increase the level of effort on fish, wildlife, and habitat management. Some public use opportunities would remain the same and others reduced in favor of wildlife and habitat protection. Alternative C, Public Use Focus, would increase the level of effort on public use opportunities and programs. The current level of effort on many fish, wildlife, and habitat management activities would remain the same, but decrease on some activities in favor of public use. Alternative D, Wildlife and Integrated Public Use Focus, would increase the level of effort on fish, wildlife, and habitat management. It would take a more proactive approach to public use management to ensure a diversity of opportunities for a broad spectrum of users, both for wildlife-dependent uses and traditional and appropriate non-wildlife uses. This alternative is the preferred alternative.



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4.2 Effects Common to All Alternatives

4.2.1 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus federal attention on the environmental and human health conditions of minority and low-income populations with the goal of achieving environmental protection for all communities. The Order directed federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their

programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information and participation in matters relating to human health or the environment.

Some of the alternative objectives in the Draft CCP and EIS have the potential for both positive and negative impacts on minority or low-income segments of the population. The elimination of permanent waterfowl hunting blinds in Alternatives B thru D would be a positive impact since it would open more areas to all persons interested in waterfowl hunting without regard to their means or ability to construct permanent blinds. Establishing a managed hunt with fee in the Barrel Blinds area of Lake Onalaska in Pool 7 (Alternative D) could exclude low-income waterfowl hunters. However, this alternative also includes a “free Saturdays” provision to ensure that people of all income levels would have the opportunity to participate in the drawings. The \$100 fee for the existing Potter’s March hunt could be limiting for low-income hunters across all Alternatives. However, the blinds or staked areas are available when not being used by the permit holder (90 percent of the hunters selected hunt less than 10 days per season), and there is ample no-fee hunting on adjacent areas of the Refuge.

The elimination of commercial fishing floats in Alternative B could have an adverse impact to low-income and minority persons who either regularly use the floats now or do not have the means for owning personal watercraft for fishing. These floats are retained under other alternatives, including the preferred alternative. Proposed boat launch fees at Service-administered boat ramps in Alternatives B thru D could create a burden for low-income users, but the fee is expected to be modest relative to the costs of boats and vehicles, and there are abundant free boat ramps provided by states and local units of government. Better oversight of fishing tournaments and commercial guiding services in Alternatives B thru D should benefit low-income anglers by keeping competition from higher-income anglers more in balance with the needs of the general public. Finally, the creation of electric motor areas in Alternatives B thru D will offer quality hunting, fishing, and wildlife observation opportunities for those who may not have the means for motorized watercraft.

Overall, none of the alternatives are expected to disproportionately place an adverse environmental, economic, social, or health effect on minority or low income persons, and in total, will likely have a positive effect.

4.2.2 Cultural and Historical Preservation

Activities outlined in each alternative have the potential to impact cultural resources, either by direct disturbance during construction of habitat projects and facilities related to public use or administration and operations, or indirectly by exposing cultural and historic artifacts during management actions such as water level drawdowns or prescribed burning. Although the presence of cultural resources including historic properties cannot stop a federal undertaking, the undertakings are subject to Section 106 of the National Historic Preservation Act, and at times, other laws.

Thus, the Refuge will, during early planning of actions, provide the Regional Historic Preservation Officer a description and location of all projects, activities, routine maintenance and operations that affect ground and structures, details on requests for allowable uses, and the range of alternatives being considered. The regional officer will analyze these undertakings for their potential to affect historic properties and enter into consultation with the State Historic Preservation Officer and other parties as appropriate. The Refuge will notify the public and local government officials to identify concerns about impacts by the undertaking. This notification will be at least equal to, but preferably with, the public notification accomplished for NEPA compliance and compatibility determinations.

4.2.3 Climate Change

The U.S. Department of the Interior issued an order in January 2001 requiring its land management agencies to consider potential climate change impacts as part of long-range planning endeavors.

The increase of carbon within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as global warming. In relation to comprehensive conservation planning for national wildlife refuges, carbon sequestration constitutes the primary climate-related impact to be considered in planning. The U.S. Department of Energy's report "Carbon Sequestration Research and Development" (U.S. DOE, 1999) defines carbon sequestration as "...the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

Terrestrial biomes of all sorts – grasslands, forests, wetlands, tundra, perpetual ice and desert – are effective both in preventing carbon emission and acting as a biological "scrubber" of atmospheric carbon monoxide. The Department of Energy's report conclusions note that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere.

The actions proposed in all alternatives would preserve or restore land and water, and thus would help mitigate human-induced global climate change through increased vegetation coverage which in turn enhances the removal and storage of carbon.

4.2.4 Prescribed Fire

As noted in Chapter 2, a comprehensive Fire Management Plan was approved for the Refuge in 2002 and provides detailed guidance for the suppression or use of fire. The plan outlines wildfire response and prescribed fire objectives, strategies, responsibilities, equipment and staffing, burn units, implementation, monitoring, and evaluation. The complete Fire Management Plan and Burn Unit Maps (USFWS, 2002c) are available at the Winona Headquarters Office, or on-line at <http://midwest.fws.gov/planning/uppermiss/index.html>.

4.2.4.1 Physical Fire Effects

Due to the relatively small size of the burn units on the Refuge and anticipated intensity and frequency of the prescribed fires, the effects on soil should be beneficial by hastening the recycling of nutrients and increasing soil fertility. There should also be no impacts to water quality due to location and slope of the burn units. Air quality should only be affected negatively in the immediate vicinity of the prescribed burn, and only for a limited time during the burn. This temporary impact to air quality will be mitigated by small burn unit size, direction of winds, and distance of units from population centers. It is expected that all burns will thus be well within air quality parameters. In the event of special air quality alerts by state or local agencies during a planned burn, burning will be deferred until conditions improve. No known archaeological sites are located on any of the burn units, and thus no impacts are anticipated. There is potential for archaeological artifacts to be present, but these are generally below the surface and would not be impacted since fire will move relatively quickly through the area and not generate high soil temperatures. Some artifacts could be exposed temporarily by the removal of vegetation, and detection and removal by the public could increase. However, all artifacts on the Refuge are protected by laws and regulations which should minimize such disturbance. The maintenance of firebreaks around certain burn units will create visual impacts for an indefinite period of time, and a local reduction of optimum habitat. However, the firebreaks are minor in terms of area compared to habitat in the burn unit, and a necessary trade-off to provide overall habitat and wildlife benefits and to minimize fire escape.

4.2.4.2 Biological Fire Effects

None of the federally listed threatened or endangered species found on the Refuge are known to inhabit or frequent the burn units that would be treated with fire, so there would be no effect. Burn units are also not in the vicinity of active bald eagle nests, so prescribed burns would pose no disturbance. Burning removes plant cover for 1-2 weeks and this would decrease the amount of habitat available for food and cover for a variety of grassland wildlife species. However, seasonal and long-term plant vigor and health would be enhanced by prescribed burns, which in turn will make the areas more productive for wildlife. In addition, since many of the burn units contain native tallgrass prairie, a fire-dependent plant community, it is expected that periodic burning will help ensure the continued existence of this rare ecosystem.

4.2.4.3 Socioeconomic Fire Effects

The use of fire often evokes an emotional response in local residents who have different experiences, fears, and values concerning wildland burning. This social impact can be mitigated to some degree by proactive information, education, and advance notification of a planned burn through media contacts and one-on-one visits with burn unit neighbors. Smoke from prescribed fires is also a concern since it can create a visibility hazard on nearby roads. In addition, smoke can enter private dwellings and businesses depending on wind direction. The fire management plan outlines precautions and specific actions to take to avoid and reduce any impacts from smoke, and contingency plans to be implemented should wind conditions change during a burn. Prescribed burning can have a benefit to the public by creating enhanced wildlife observation, photography, and hunting opportunities through the resulting increase in wildlife populations. Fire breaks put in place for prescribed burning can also help stop an unplanned wildfire and thus provide a measure of protection to any adjacent private habitat or dwellings. In the event that a prescribed fire does jump a firebreak and burn into unplanned areas, there is a high probability of rapid control by staff on-the-ground and thus minimal adverse impact. In addition, prescribed burn units on the Refuge average less than 125 acres, have light fuel loads (.025 to 3 tons per acre), and will be burned under low fuel moisture conditions and specific wind and weather conditions. These factors will help avoid and minimize fire escape.

4.2.5 Adjacent Land Owners

Land owners adjacent to the Refuge may benefit economically from owning property next to the Refuge. A recent report (Boyle et al. 2002) shows that land and property values are typically higher for properties next to a national wildlife refuge, when holding other factors constant. For example, a four-bedroom, two bath house on a quarter acre lot increases in value as the distance from the Refuge decreases. For the four refuges included in the report, property values increased from \$351 to \$7,469 per mile as the distance of each property to the refuge decreased. The report states on page 19:

The significant premium people pay to purchase properties near refuges clearly indicates that [refuges] provide desirable environmental amenities and permanent open space to local residents.

As property value increases, taxes would also be expected to increase. While this may result in increased revenue for the county, it also increases the tax burden for adjacent land owners. However, based on several townships included in the report, the annual tax increase of properties adjacent to refuges is fairly small, with annual tax increases averaging between \$88 and \$112 per home.

Since the alternatives would not radically change current management direction, it is not anticipated that any of the alternatives would have a significant effect on property values in general or on the desirability of owning or buying property adjacent to the Refuge.

4.2.6 Marinas and Other Water Related Business

Under all alternatives there are minimal economic effects to marinas and other water-related businesses since opportunities for water-related recreation are common to all alternatives. In addition, any pool drawdowns described in the alternatives would be designed, or offset by access dredging, to avoid or minimize impacts to private marinas and other businesses. Lower water levels may cause some inconvenience or require extra caution by boat operators, but they would not measurably disrupt marina use. Some alternatives would restrict access to some areas of the Refuge by large boats most frequently associated with marinas, but none of these proposed actions restrict access or use of the main river channel where most boating occurs. Habitat improvements and care of the scenic qualities of the Refuge will continue to make the Refuge a destination-of-choice for many boaters and provide a long-term benefit to marinas and other water-related recreation businesses adjacent to the Refuge.

4.2.7 Commercial Navigation

Under all alternatives there is no impact to commercial navigation. All proposed actions have been tempered by the requirement in establishment legislation that Refuge management not interfere with the navigation operations carried out by the Corps of Engineers.

4.2.8 Commercial Forest Harvest

There is currently little commercial tree harvesting done on the Refuge. Under all action alternatives, a Forest Management Plan would be completed subsequent to the completion of a Forest Inventory. Although some increase in commercial harvest may occur, it is unknown what the level of harvest will be. However, given the floodplain nature of the Refuge and current forest species composition, harvest will likely be modest, selective, and restrictive in nature. It is anticipated that resulting economic impact would be minimal. The Forest Management Plan will outline methods and means of harvest to avoid, minimize, or mitigate any short- or long-term impacts from tree harvest operations.

4.2.9 Threatened and Endangered Species

All alternatives in the Draft CCP and EIS have objectives to improve habitat conditions for native fish and wildlife including species listed as threatened or endangered under the Endangered Species Act. It is anticipated that nearly all habitat restoration/enhancement projects constructed on the Refuge during the next 15 years will be funded by other federal programs like the Environmental Management Program, operation and maintenance of the federal 9-Foot Channel Project, and potentially the Illinois Waterway System Navigation Feasibility Study. For activities implemented under these programs, the U.S. Army Corps of Engineers is responsible for compliance with the Endangered Species Act. In 2004, the U.S. Army Corps of Engineers evaluated potential impacts to the federally endangered Higgins eye pearl mussel (*Lampsilis higginsii*) and threatened Bald Eagle (*Haliaeetus leucocephalus*) from a variety of habitat activities in their Biological Assessment for the Illinois Waterway System Navigation Feasibility Study (Corps of Engineers 2004a). The Service concurred with the Corps' biological assessment findings that these habitat activities are not likely to adversely affect Bald Eagles (U.S. Fish and Wildlife Service 2004c). However, some habitat activities are likely to adversely affect Higgins eye pearl mussels (i.e. pool drawdowns, dredging, island restorations, etc.). Conservation measures and other mandatory conditions were provided to the Corps of Engineers to minimize take of Higgins eye from these activities.

Consequently, the required Endangered Species Act consultation has been completed for nearly all habitat activities proposed on the Refuge during the next 15 years. Other projects or activities in the Draft CCP during the next 15 years (new boat ramps, parking facilities, buildings or other

structures), are not likely to adversely affect Bald Eagles or Higgins eye pearlymussels. This opinion is based on construction of similar projects in the past; to date, none of these activities have adversely affected federally listed species.

There are currently three candidate species that occur on the Refuge or in the vicinity of the Refuge. The Eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*) is known to occur at only two sites within the Refuge, although potential habitat exists elsewhere on the Refuge. Currently, the Draft CCP includes both targeted and non-targeted benefits for eastern massasauga. First, the objectives include restoring sedge meadow, bottomland forest, and reducing the pervasiveness of exotic species throughout the Refuge. All of these actions could have long-term benefits for eastern massasauga by providing or enhancing potential habitat. Second, the Refuge is in the process of developing Candidate Conservation Agreements for eastern massasauga at the two known localities. Although both agreements are still in the development phase, the commitment is to: (1) implement massasauga-compatible management, (2) restore or enhance habitat to support a viable population, and (3) provide long-term protection for such habitat. Although massasauga-compatible management will be conducted, unavoidable impacts may occur. These impacts should be rare and minimal in extent, however, as the Refuge is committed to using the best management practices developed specifically for eastern massasauga.

The spectaclecase (*Cumberlandia monodonta*) and sheepnose (*Plethobasus cyphus*) are also candidate species of freshwater mussels that historically occurred on the Upper Mississippi River within the states of Iowa, Minnesota and Wisconsin. The Service and other federal and state partners are actively involved in native mussel conservation programs on the Upper Mississippi River through the interagency Mussel Coordination Team (MCT). Since 2000, activities of the MCT include propagation and reintroduction of federally endangered Higgins eye pearlymussels (Mussel Coordination Team 2000). The team is now implementing conservation activities for the federally endangered winged mapleleaf. We anticipate that future activities will include the spectaclecase and sheepnose. For these reasons and given that the goals and objectives of the Draft CCP directly and indirectly benefit the continued survival of eastern massasauga, spectaclecase and sheepnose, the implementation of the CCP is not likely to appreciably reduce the survival and recovery of these species. On the contrary, the expectation is for implementation of a Final CCP to perpetuate viability of these species within the Refuge.

Section 4.4.1 of this chapter contains additional information, by alternative, on the potential impacts to currently listed species, namely the Bald Eagle and Higgins eye pearlymussel.”

4.2.10 Furbearer Trapping

Under all alternatives, the currently approved furbearer trapping program would continue unchanged until a new furbearer trapping plan is completed by June 2007. A description of the current program can be found in Chapter 3, sections 3.2.14 and 3.4.3. Impacts from the current trapping program are summarized in the current compatibility determination, Appendix E. Until the new plan is completed, future biological and economic impacts are unknown. A separate environmental assessment will be done in conjunction with preparation of the new furbearer trapping plan and all impacts explored. Public involvement will be part of new plan preparation.

4.3 Effects of Alternatives on Physical Parameters/Concerns

4.3.1 Water Quality

Alternative A – No Action

This alternative is expected to have little positive or negative impact to overall water quality on the Refuge. Although Refuge staff efforts in tributary watersheds will be minimal, a continued improvement in nutrient loads is expected from actions taken in watersheds as a whole pursuant to various state and federal water quality regulations and agricultural conservation practices. Some habitat projects will increase water turbidity during construction, but this effect will be of relatively short duration and off set by long-term gains in local water quality associated with the project. Sediment sampling is undertaken prior to construction of habitat projects involving sediment disturbance to assess threats from contaminant release and appropriate measures are taken to avoid or minimize such release. Improvements in aquatic vegetation by ongoing habitat efforts such as pool drawdowns could help reduce nutrient loads and improve water quality downstream.



Lily field. Copyright Sandra Lines

Alternative B – Wildlife Focus

Same as A, except that water quality should be more positively affected by an increase emphasis in watershed conservation and restoration work. This would include private lands staffing to accelerate technical assistance to landowners and partners for watershed scale habitat assessment, mapping, modeling, and protection; and restoration through cooperative conservation partnerships. Support of the Upper Mississippi River Basin Association's efforts to develop more consistent standards for monitoring water quality will lead to better evaluation and improved project design and implementation in line with adaptive management practices. Improvements in water quality will positively effect plants and animals and improve a variety of public use opportunities related to these resources.

Alternative C – Public Use Focus

Same as Alternative B.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.3.2 Sedimentation

Alternative A – No Action

Under this alternative, sediment deposits in certain backwaters would be reduced through ongoing habitat projects like those done under the Environmental Management Program. The rate of sediment deposition would also be positively affected by some of these same projects where closing or deflection structures are used. On a larger scale, this alternative would not lead to any marked changes in watershed conditions and the amount of sediment entering the Refuge would remain the same.

Alternative B – Wildlife Focus

Same as A, except that sedimentation on a broader scale should be reduced over time by an increase emphasis in watershed conservation and restoration work. This would include private lands staffing to accelerate technical assistance to landowners and partners for watershed scale habitat assessment, mapping, modeling, protection, and restoration through cooperative conservation partnerships.

Alternative C – Public Use Focus

Same as Alternative B.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.3.3 Geomorphology¹

Alternative A – No Action

Under this alternative, there will be moderate, local changes in floodplain geomorphology as projects involving island construction, dredging for fishery habitat, and flow diversion are completed. However, overall geomorphology will continue to be driven by flood events, off-Refuge land use practices, and maintaining navigation capability through channel dredging and river impoundment.

Alternative B – Wildlife Focus

Same as alternative A, except that geomorphology on a broader scale could be influenced by an increased emphasis in watershed conservation and restoration work which could affect peak flow levels and amount of sediment deposition.

Alternative C – Public Use Focus

Same as Alternative B.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.3.4 Hydrology and Water Level Management

Alternative A – No Action

Under this alternative, there would be no overall change in the hydrology of the river through the Refuge. Water level management, or pool drawdowns, would continue at the current rate and eventually be accomplished on several pools.

Alternative B – Wildlife Focus

The additional staffing and funding for watershed-scale technical assistance in this alternative could lead to a gradual moderation in peak tributary flows during spring runoff and storm events. Pool drawdowns could increase, especially if an Access Trust Fund is established to address supplemental dredging needs, and/or if drawdowns become part of the Corps of Engineers' Operating Plans for pools and move from experimental to operational.

Alternative C – Public Use Focus

Same as Alternative B, except that in regard to drawdowns, impacts would be the same as Alternative A.

1. "Geomorphology" refers to the physical structure of the floodplain.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.3.5 Landscape Considerations

Alternative A – No Action

The scenic and wild qualities of the Refuge would remain virtually unchanged, although long-term, a decline is likely due to an inadequately surveyed and posted boundary, modest acquisition of floodplains and bluffland areas, decline in forest condition, and continued unregulated growth in public uses which can directly impact habitat. Some of this decline would be mitigated by ongoing habitat management. For example, prescribed fire enhances the diversity and structure of native prairie which also improves its scenic qualities.

Alternative B – Wildlife Focus

An increased rate of land acquisition of both floodplain habitats and identified bluffland areas would help protect the scenic and wild qualities of the Refuge. More proactive forest management would help ensure the long-term health of the floodplain forest which directly influences the landscape of the Refuge. Prescribed fire would enhance the diversity and structure of native prairie and improve its scenic qualities. A restriction on locations of certain public uses would help safeguard habitat and protect the wild nature of the Refuge backwaters. Management planning for Research Natural Areas would take into consideration landscape values.

Alternative C – Public Use Focus

Same as Alternative A, except the increased rate of land acquisition would help protect the scenic and wild qualities of the Refuge. This gain could, however, be negated to some degree by increases in public use.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B, Wildlife Focus, except that guiding principles for habitat projects would include a principle on aesthetic considerations which would help protect the scenic and wild character values of the Refuge landscape. This alternative would also help protect these values above the other alternatives if the Refuge is designated as a Wetland of International Importance (Ramsar Convention).

4.4 Effects of Alternatives on Biological Parameters/Concerns

4.4.1 Threatened and Endangered Species

Alternative A – No Action

Acquisition of lands at current rates would protect additional lands and further the expansion of bald eagle nesting populations. Loss of mature trees and conversion of the floodplain forest to other habitat such as reed canary grass would limit nesting opportunities for bald eagles. Disturbance from motorboats and other recreation at bald eagle nesting, roosting, and fall foraging sites would continue unchecked with presently unknown consequences to overall productivity or Refuge use. Water quality concerns such as high nutrient loads may result in a poor quality fishery, limiting the food base for bald eagles. Conversely, limited control of invasive fish may improve foraging opportunities for eagles. Higgins eye pearlymussel would continue to be negatively impacted by the uncontrolled spread of zebra mussels, invasion of Asian carp, and continued rates of sedimentation. Drawdowns may leave Higgins eye pearlymussels stranded above the water line, and this possible impact would be mitigated by modifying the daily rate of water lowering and physically moving the

mussels to deeper water. All potential impacts to threatened and endangered species from habitat projects or Environmental Pool Plan implementation will be evaluated and addressed through the section 7 consultation process.

Alternative B – Wildlife Focus

Acquisition and private land partnerships would protect additional lands and further the expansion of bald eagle nesting populations. The fishery prey-base for eagles would be enhanced through improved water quality, decreased sedimentation, expanded emergent and aquatic vegetation, and improved backwater spawning and rearing habitats. Improved forestry management would encourage uneven-aged stands, regeneration of hardwoods, and longevity of large, mature trees. Better management of invasive species (e.g. reed canary grass and Asian carp) would help maintain forests and native fisheries. Natural Area management plans would include special emphasis for nesting and roosting bald eagle habitats. Expanded habitat monitoring would improve management decisions affecting bald eagles and Higgins eye pearlymussels. Disturbance to nesting eagles by motorboats would decrease in new electric motor areas, in closed areas during fall foraging, and on certain islands and shorelines under new beach use guidance that limits recreational activities. Survival of Higgins eye pearlymussels may improve as more attention is given the control of invasive animals. Drawdowns may leave Higgins eye pearlymussels stranded above the water line, and this possible impact would be mitigated by modifying the daily rate of water lowering and physically moving the mussels to deeper water. All potential impacts to threatened and endangered species from habitat projects or Environmental Pool Plan implementation will be evaluated and addressed through the section 7 consultation process.

Alternative C - Public Use Focus

Same as Alternative A, except that accelerated land acquisition would provide more potential nesting and roosting sites for Bald Eagles, and improvements to the fishery prey-base could result from better water quality and productivity through increased private lands efforts and pool drawdowns. However, increasing and unmanaged public recreation may limit the attractiveness of new and existing areas to nesting bald eagles depending on the type and timing of recreation. This potential negative impact could be offset by the increased public awareness of issues affecting threatened and endangered species through the additional interpretive and environmental education programs in this alternative.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B, except the additional interpretive and environmental education programs in this alternative could increase public awareness of issues affecting species and improve their overall conservation.

4.4.2 Waterfowl

Alternative A – No Action

Waterfowl, especially dabbling ducks and Canada geese, would benefit from additional wetland areas protected through a modest acquisition program. Pool drawdowns and other habitat projects would improve macroinvertebrate and aquatic plant food resources for waterfowl. Invasive plants and animals would continue to impact waterfowl habitats and food resources. Poor water quality and sedimentation would impact fingernail clams, a major food resource for canvasbacks, scaup, and other diving ducks. Closed areas would provide sub-optimum resting and feeding habitat due to lack of aquatic plants and macroinvertebrates, as well as disturbance from people in boats. Disturbance to ground nesting waterfowl would continue and perhaps affect nest success. Cavity nesting ducks, particularly wood ducks would find fewer nest trees as forests convert to other habitat such as reed canary dominated grasslands. Overall, waterfowl production and waterfowl numbers and use-days during migration would be expected to remain the same, or decline.

Alternative B – Wildlife Focus

Waterfowl, especially dabbling ducks and Canada geese, would benefit from additional wetlands protected through acquisition and partnerships with private landowners.

Macroinvertebrate and aquatic plant food resources would be enhanced with the increased use of drawdowns and other management actions in the Environmental Pool Plans. Aquatic habitats would be further improved with the reduction of invasive plants and animals.

Migrating waterfowl would find more resting and feeding areas, including new areas with abundant food resources. Fingernail clams and other aquatic invertebrates which provide food

for waterfowl may become more abundant with improvement in water quality and reduced sedimentation. Disturbance to resting and feeding birds would be reduced by no entry areas. Disturbance to ground nesting waterfowl would decrease by more control of beach-related and other public uses. Nest sites for cavity nesting ducks would become abundant with better forest management practices. The closed area on Lake Onalaska would be enhanced and less crippling would occur with the elimination of the firing line on the north end of the lake. Expanded habitat and wildlife monitoring would improve management decisions. Overall, waterfowl production and waterfowl numbers and use-days during migration would be expected to increase.



Canada Geese. Copyright Sandra Lines

Alternative C – Public Use Focus

Same as Alternative A in terms of habitat effects on waterfowl. Additional wetlands for waterfowl would be protected through acquisition and easements. Drawdowns would improve aquatic plant and invertebrate resources. Invasive plants and animals would continue to degrade the river system impacting food and nesting resources for waterfowl. Cavity nesting ducks, particularly Wood Ducks, would find fewer nest trees as forests convert to reed canary dominated grasslands. Waterfowl would realize less benefit from habitat projects which also emphasize recreational fishing or boating access. Increased public education would help expose young people to the needs of wildlife, build a healthy outdoor ethic, and improve the overall attitude of the public towards wildlife conservation. However, waterfowl would suffer as funding would be diverted for recreation, interpretation, and environmental education rather than habitat management and monitoring. Food resources in many closed areas would continue to be limited and waterfowl would experience the same level of disturbance from boats. Additional disturbance to dabbling ducks would occur on Lake Onalaska by opening the north end of the closed area to hunting. Overall, waterfowl production and waterfowl numbers and use-days during migration would be expected to decline.

Alternative D – Wildlife and Integrated Public Use Focus

Waterfowl, especially dabbling ducks and Canada geese, would benefit from additional wetlands protected through acquisition and partnerships with private landowners. Macroinvertebrate and aquatic plant food resources would be enhanced with the increased use of drawdowns, and improvements in water quality and sedimentation. Aquatic habitats would be further improved with the reduction of invasive plants and animals. Migrating waterfowl would find more closed areas in areas of abundant food resources. Disturbance to resting and feeding birds during migration would be reduced by no fishing or motorized travel in no entry areas. Nesting waterfowl would be more productive by limiting disturbance from dogs and people. Nest sites for cavity nesting ducks would become abundant with better forest management practices. Expanded habitat and wildlife monitoring would improve management decisions. Use of funds to encourage environmental education and interpretation would be balanced with the needs for habitat management and monitoring. Some habitat projects would be designed specifically to enhance waterfowl habitat,

while most would include waterfowl benefits. Overall, waterfowl production and waterfowl numbers and use-days during migration would be expected to increase.



Sandhill Crane. Copyright Sandra Lines

4.4.3 Other Migratory Birds

Alternative A – No Action

Migratory birds would benefit from additional floodplain forest, wetland, and grassland areas protected through a modest acquisition program. Current trends in hydrology, plant succession, and invasive plants on the Refuge will result in significant changes in tree species composition, forest fragmentation, and the conversion of forests to grasslands over the next 50 to 75 years. Species like great blue herons, great egrets and cerulean warblers that favor

tall trees for roosting and nesting will decline. Both resident and long-distance migratory songbirds utilize closed canopy silver maple forest for nesting and migration. Silver maple will likely decline in coverage and vigor over time without management action, negatively impacting forest-dependent, large tract species such as red-shouldered hawk and prothonotary warbler. Fewer bluffslands would be conserved for migrating songbirds and raptors. Improvement of emergent marsh habitat through habitat projects such as island construction and pool drawdowns would positively impact a variety of birds such as bitterns, rails, black terns and pied-billed grebes. Shorebird habitat would improve through similar habitat projects, creating increased shallow water and exposed mud areas used for foraging during migration. Overall, migratory bird production and use would stay the same or improve for some species, and gradually decline for others under this alternative.

Alternative B- Wildlife Focus

Migratory birds would benefit from additional floodplain forest, wetland, and grassland areas protected through an accelerated land acquisition program. Some bluffland and lower tributary tracts, important for songbird and raptor migration and nesting, would be protected by fee-title or easement acquisition. Buffer land between development and key Refuge habitats would be acquired and reduce fragmentation. Habitat would be supplemented and connected through private landowner agreements, using Department of Agriculture program incentives. Better forestry practices would promote regeneration of hardwoods, mast producing trees, closed-canopy silver maple, and uneven age stands, resulting in more use by birds. Reduction of forest fragmentation and control of invasive plants would benefit forest interior bird species. More frequent use of drawdowns would improve emergent marshes for bitterns, rails, and other over-water nesting marsh birds. Shorebirds would benefit from shallow water and exposed mud flats during drawdowns. Electric motor areas would reduce disturbance to birds and likely increase productivity of marshbirds such as bitterns and rails, and colonial nesting birds such as herons and egrets. Better monitoring of habitat and birds would help managers make more timely and effective habitat and public use management decisions. Overall, migratory bird production and use would stay the same or improve for a host of migratory bird species under this alternative.

Alternative C – Public Use Focus

Same as Alternative A, except increases in interpretive and environmental educational programs would increase public awareness of migratory birds and result in more support for their conservation.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B, except increases in interpretive and educational programs would increase public awareness of migratory birds and result in more support for their conservation.

4.4.4 Sport Fish

Alternative A – No Action

Refuge involvement in fishery management would remain limited under this alternative and have indirect sport fish impacts. Since there would be little fishery planning, no clear Refuge-specific fishery objectives, and no increase in monitoring, opportunities for integrating fishery management with Refuge management would remain limited and opportunities lost for improving sport fish habitat. Any negative impacts from fishing tournaments or commercial fishing could continue without Refuge involvement and oversight. Coordination and sharing of expertise with the Service's fisheries resource office and the states would also be limited and the impacts to sport fish unknown. Without private land and watershed work in the tributaries, silt, nitrates and other contaminants would continue to enter the river system at current rates and impact sport fish. Some habitat projects would be designed to help over-wintering habitat for centrarchid fish such as crappies, sunfish, and large-mouthed bass, and increase populations. In general, implementation of Environmental Pool Plans and habitat projects would improve water quality and habitat for most fish. However, future increases in exotic fish and plants may prove detrimental to some native sport fish. Overall, this alternative, on balance, would likely have a positive influence on sport fish on the Refuge due to continued habitat improvements through specific projects and pool drawdowns.

Alternative B – Wildlife Focus

Refuge involvement in fishery management would increase substantially under this alternative and have direct and indirect sport fish impacts. With a new fishery biologist, a fishery management plan, Refuge-specific fishery objectives, and an increase in monitoring, opportunities for integrating fishery and wildlife management with Refuge administration and operations would help increase sport fish populations. Any negative impacts from fishing tournaments or commercial fishing would be lessened by Refuge involvement and oversight. Coordination and sharing of expertise with the Service's fisheries resource office and the states would increase substantially to the benefit of sport fish initiatives and management. Private lands work in the tributaries would help reduce silt, nitrates, and other contaminants and help sport fish health and productivity. Some habitat projects would be designed to help over-wintering habitat for centrarchid fish such as crappies, sunfish, and large-mouthed bass, and could be done in all areas of the Refuge, including Waterfowl Hunting Closed Areas. In general, implementation of Environmental Pool Plans and habitat projects would improve water quality and habitat for most fish. Increased attention to invasive aquatic plants and animals could lead to improved sport fish carrying capacity on the Refuge. Overall, this alternative would have a positive influence on sport fish populations on the Refuge.

Alternative C – Public Use Focus

Same as Alternative A, except that private lands work in the watersheds could improve sport fish health and productivity by reducing the amount of sediment, nutrients, and contaminants entering the Refuge.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.4.5 Other Fish

Alternative A – No Action

This alternative is unlikely to improve water quality or restore historic flows, and productivity of paddlefish and sturgeon will continue to be negatively impacted. Without private land and watershed work in the tributaries, silt, nitrates and other contaminants would continue to enter the river system to the detriment of fish. Limited coordination with the states and the Service's fisheries resource office, little oversight of potentially damaging commercial and recreational fishing, and lack of a fishery management plan will limit attention on priority fish species which could negatively impact their long-term health and productivity. Environmental Pool Plan projects include concepts

to improve fish passage through the locks and dams. Likewise, habitat projects could include provisions for deep water holes and travel lanes for paddlefish and sturgeon, features that would benefit all fish species. However, continued spread of invasive aquatic plants and animals could negate habitat gains, or as is the case with fish passage, limit the use of certain management tools. Overall, this alternative, on balance, would likely have a positive influence on some species of fish due to continued habitat improvements through specific fishery projects, and be neutral for other species. However, the populations of some species, such as paddlefish and sturgeon, would likely continue to decline.

Alternative B – Wildlife Focus

Work on private lands in tributary watersheds may improve water quality and reduce siltation, enhancing spawning areas for paddlefish, sturgeon, and other fish. With a new fishery biologist, a fishery management plan, Refuge-specific fishery objectives, and an increase in monitoring, opportunities for integrating fishery management with Refuge administration and operations would increase and help improve fish populations. Coordination with the states and Service's fisheries resource office would increase, leading to additional habitat projects which should benefit all fish species. Increased oversight of commercial fishing could help limit negative impacts to fish species of concern, and provide positive benefits by increased harvest of invasive fish species. Environmental Pool Plan projects include improved fish passage through the locks and dams which would benefit several species. Likewise, habitat projects could include provisions for deep water holes and travel lanes for paddlefish and sturgeon. Invasive plants and animals would continue to increase, but better monitoring and interagency cooperation may lead to more successful control efforts and reduced impacts to fish. Overall, this alternative would increase fish productivity, distribution, and health.

Alternative C – Public Use Focus

Same as Alternative A, except that private lands work in the watersheds could improve overall fish health and productivity by reducing the amount of sediment, nutrients, and contaminants entering the Refuge.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.4.6 Freshwater Mussels

Alternative A – No Action

Poor water quality and continued rates of sedimentation would continue to diminish reproduction and growth rates of most mussels. Survival of juvenile mussels would continue to be compromised because of lack of oxygen and silt accumulation in the substrate. In general, the diversity of mussel species would decline and soft substrate adapted mussel species such as floaters, papershells, and heelsplitters would dominate. Invasive zebra mussels would continue to spread and cause mortality to native mussels. Impacts related to impoundment of the river and subsequent loss of habitat heterogeneity could be improved by implementation of habitat projects and Environmental Pool Plans. Impacts of specific habitat projects to mussel beds would need to be evaluated on a case-by-case basis. Distribution and survival of juvenile mussels would be enhanced by improved fish passage through the locks and dams as proposed in the Environmental Pool Plans. However, the lack of a fishery and mussel management plan, and oversight of recreational and commercial fishing and clamming, would hamper efforts to improve mussel populations and their host fish species. Future increases in invasive black carp that forage on mussels, could have severe impacts. Sporadic drawdowns could be damaging to mussel beds if the water is lowered too quickly or too far. Overall, mussel populations and productivity are expected to stay the same or decline under this alternative.

Alternative B – Wildlife Focus

Work on private land in the tributaries would benefit mussels by improving water quality and decreasing sediment entering the river. Less sediment in the river would provide a better diversity

of bottom substrates to accommodate a more historic assemblage of species. A fishery management plan and oversight of commercial fishing and clamming would improve conditions for host fish and decrease mortality of mussels. Better monitoring and control of invasive plants and animals, especially zebra mussels, would improve survival of native mussels. Impacts related to impoundment of the river and subsequent loss of habitat heterogeneity could be improved by implementation of habitat projects and Environmental Pool Plans. Specific impacts of projects to individual mussel beds would need to be evaluated on a case-by-case basis. Distribution and survival of juvenile mussels would be enhanced by improved fish passage through the locks and dams as proposed in the Environmental Pool Plans. Increased use of drawdowns would in general improve river vigor and health, habitats, and food resources for mussels. However, drawdowns could negatively impact mussels if the water is lowered too quickly or too far. Public education about relatively unknown species like mussels would not be emphasized and support for conservation efforts may suffer. Overall, this alternative would have a positive effect on mussel productivity and health on the Refuge through the combination of improved water quality, specific habitat projects benefiting mussels, public use oversight, and increased attention on invasive aquatic species.

Alternative C – Public Use Focus

Same as Alternative A, except that private lands work in the watersheds could improve overall mussel health and productivity by reducing the amount of sediment, nutrients, and contaminants entering the Refuge. Also, the emphasis on interpretation and environmental education would increase public awareness and support for mussel conservation.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B except that an increased emphasis on interpretation and environmental education would increase public awareness and support for mussel conservation.

4.4.7 Reptiles and Amphibians

Alternative A – No Action

A modest land acquisition program under this alternative would provide additional habitat safeguards for most reptiles and amphibians. Contaminants, high nutrient loads, and siltation would continue to stress aquatic reptiles and amphibians. A lack of knowledge about the distribution and life history of turtles, frogs, and snakes on the Refuge would continue to hamper sound decisions regarding impacts of human activities. Limited drawdowns may improve emergent and submergent habitats important for amphibians and turtles. However, improvements would likely be short-lived without increased attention to invasive aquatic plants, particularly Eurasian milfoil, which can choke important foraging and travel areas for turtles and frogs. Reed canary grass would continue to invade bottom land forests, creating a more open forest canopy. Massasauga rattlesnakes would benefit from more openings, but only if openings have a strong sedge meadow component and nearby forests remain intact for over-wintering. Without intervention, bottom land forests would convert to reed canary grass openings and even age monocultures of silver maple negatively impacting reptile and amphibian breeding and over-wintering. Human disturbance could continue to impact turtle nesting on sandy islands and shorelines. Projects implemented through habitat projects and Environmental Pool Plans could be designed to provide nesting beaches, loafing sites, and calm backwaters for amphibians and turtles. Environmental Pool Plans also include concepts to improve connectivity between the main river channel and backwaters. Reptiles and amphibians would benefit from improvements in backwater habitats and ease of travel between them. Overall, this alternative, on balance, would likely have a positive influence on many species of reptiles and amphibians on the Refuge due to continued habitat improvements. However, some species' populations would likely continue to decline due to lack of attention on forest habitat, invasives, and human-caused impacts.

Alternative B – Wildlife Focus

Land acquisition could provide better buffers between development and key habitats for reptiles and amphibians, especially turtles that need to travel from wet to dry land to nest. Water quality would improve as more work is done with private landowners along the tributaries to curb contaminants, nutrients, and sediment entering the river. Increased use of drawdowns would improve the health and vigor of emergent and submergent habitats to the benefit of loafing and foraging turtles and frogs. Invasive plants would be monitored and controlled, improving both aquatic and terrestrial habitats that reptiles and amphibians use for foraging and reproducing. Forest resources would be monitored and actively managed to the benefit of frogs, toads and turtles. Forest practices could include efforts to improve sedge meadow openings for Massasauga rattlesnake habitat. Improved monitoring and research would facilitate more informed decisions regarding land use and impacts to turtles and frogs. The distribution and life history of turtles along the river would be investigated so that better decisions could be made with respect to dredging and other channel maintenance activities. Projects implemented through habitat projects and Environmental Pool Plans could be designed to provide nesting beaches, loafing sites, and calm backwaters for amphibians and turtles. Environmental Pool Plans also include concepts to improve connectivity between the main river channel and backwaters. Reptiles and amphibians would benefit from improvements in backwater habitats and ease of travel between them. Conflicts with human uses would be addressed. Some beaches could be closed to human use during key turtle nesting periods. Some backwaters would become electric motor areas, limiting disturbance to snakes, frogs, and turtles. Public education programs would be limited and support for conservation of more obscure species like frogs and turtles may suffer. Overall, reptile and amphibian populations and productivity would likely increase under this alternative.



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Alternative C – Public Use Focus

Same as Alternative A, except that private lands work in the watersheds could improve overall reptile and amphibian health and productivity by reducing the amount of sediment, nutrients, and contaminants entering the Refuge. In addition, an increased rate of land acquisition would safeguard important habitat, and a focus on public education would increase awareness of the conservation needs of reptiles and amphibians.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B, except that a focus on public education would increase awareness of the conservation needs of reptiles and amphibians.

4.4.8 Invasive Species

Alternative A – No Action

Invasive plants and animals would continue to spread on the Refuge and have the negative effects described in previous sections.

Alternative B – Wildlife Focus

Under this alternative, managers would gain a better understanding of the location and extent of invasive plants and seek a 10 percent reduction in acreage infected. Cooperation with other agencies may begin to provide solutions for managing invasive animals such as Asian carp and zebra mussels. Public awareness of the impacts of invasive species and the public's role in their spread may reduce new invasions and promote support and funding for control efforts.

Alternative C – Public Use Focus

Same as Alternative A, except public awareness of the impacts of invasive species and the public's role in their spread may reduce new invasions and promote support and funding for control efforts.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.4.9 Invertebrates

Alternative A – No Action

Water quality is a critical component of maintaining healthy aquatic invertebrate populations. Little work would occur on private land in the tributaries, and contaminants, nutrients, and sediment would continue to enter the river to the detriment of aquatic insects. Aquatic insects would see some short-term benefits from drawdowns. Large hatches of invertebrates would occur as the soils warm and plant growth is stimulated. Long-term benefits would be limited unless drawdowns occurred on a more frequent rotation. Fingernail clams would not see much change in population size, due to poor water quality and clarity. Crayfish are important for many other species. The health of crayfish populations may decline without improvement in water quality and better management of bottomland forests. Diversity and abundance of terrestrial invertebrates would not change. Little monitoring of invertebrates would occur and managers would miss an important opportunity to gauge water quality and river health.

Alternative B – Wildlife Focus

Work on private land within tributary watersheds would improve water quality and benefit aquatic insects. Drawdowns would promote plant growth and warm the surface of the mud stimulating hatching of aquatic insects, and this positive effect would likely continue for several reproductive cycles after a drawdown. Availability of detritus and decaying plants would provide abundant food and substrate resources for aquatic invertebrates. Fingernail clams would benefit from improved water quality and clarity. On the other hand, although the relationship is unclear, increased growth of submergent plants through drawdowns or other actions may suppress production of fingernail clams. Terrestrial insects would benefit from active grassland management, particularly burning which promotes reproduction by warming the soil and providing abundant plant growth. Crayfish provide resources for many other species in the system and they would benefit from better management of bottomland forests. Improved water quality and better connectivity of the main channel with backwaters would benefit all invertebrate species. Monitoring of invertebrates would provide an important indicator of water quality and river health.

Alternative C – Public Use Focus

Same as Alternative A.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.4.10 Mammals

Note: The impacts of the current trapping program on furbearers is discussed in the compatibility determination for trapping, found in Appendix E. See also Section 4.2.10 in this chapter.

Alternative A – No Action

All mammal species on the Refuge would benefit from the modest acquisition program in this alternative. Muskrats, beaver, mink, raccoon, and otter populations would likely increase due to improved beds of emergent vegetation from drawdowns and habitat projects in Environmental Pool Plans. Habitat projects would also increase resting, foraging, and denning areas for these and other mammals. Invasion of bottomland forests by reed canary grass, conversion of forests to

monocultures of even-age silver maple, and loss of hardwoods would contribute to declining beaver populations, while mast-seeking species such as squirrels and deer would likely decline on the Refuge.

Alternative B – Wildlife Focus

All mammal species on the Refuge would benefit from the accelerated acquisition program in this alternative. In general, improved water quality, frequent drawdowns, and Environmental Pool Plan projects would improve habitats for most mammals, and especially furbearers. Increased monitoring would improve habitat project planning and management decisions on public uses involving mammals. Active management of grasslands and forests, including the control of invasive plants, would benefit all mammal populations. Overall, the increased attention to improving wetland, grassland, and forest habitat in this alternative would increase the productivity and health of most mammals.

Alternative C – Public Use Focus

Same as Alternative A.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.4.11 Aquatic Vegetation/Wetlands

Alternative A – No Action

A modest acquisition program would protect additional wetland acres which would in turn provide for their long-term protection while safeguarding aquatic plants. Little work would occur on private land in the tributary watersheds and limit improvements to water clarity which has a marked effect on aquatic plant germination, growth, and sustainability. Pool drawdowns would occur periodically with dramatic but localized improvement in aquatic vegetation. Drawdown frequency, however, would continue to be limited by funding. Habitat projects through the Environmental Management Program and other programs will continue to improve aquatic vegetation composition, density, and reproduction by altering currents and providing areas sheltered from wind and wave action. Invasive aquatic plants would continue to increase and displace and exclude native plants. Asian carp such as grass carp will likely invade new areas and may negatively impact aquatic vegetation and wetland quality through direct feeding on plants and rooting of plant beds and lowering of water clarity. Overall, this alternative is likely to result in localized improvement to aquatic vegetation and a modest increase in wetland habitat afforded permanent protection.

Alternative B – Wildlife Focus

Work on private land within tributary watersheds would reduce the amount of sediment and nutrients entering the Refuge and improve aquatic plant germination, growth, and sustainability. Wetland acres permanently protected would increase markedly under a more aggressive acquisition program. Pool drawdowns would occur periodically with dramatic but localized improvement in aquatic vegetation. Drawdown frequency could increase under this alternative and improve and sustain more acres of aquatic vegetation. Habitat projects through the Environmental Management Program and other programs will continue to improve aquatic vegetation composition, density, and reproduction by altering currents and providing areas sheltered from wind and wave action. Invasive plants would be monitored and control efforts increased. Invasive fish have a profound impact on aquatic plants because they pull up plants while foraging and cause excessive turbidity. Better fisheries planning and interagency coordination may help check the spread of invasive fish. However, these gains would be off set to some degree since little effort would be made to increase public information and education regarding the impacts and control of invasives. Aquatic vegetation could improve in existing backwaters with a decrease in motorized traffic due to electric motor only areas and better oversight of fishing tournaments. Additional and more effective waterfowl hunting closed areas would likely lead to better distributed waterfowl which could affect the amount of

aquatic vegetation they consume in any one area. Overall, this alternative is likely to result in more widespread improvement to aquatic vegetation and a substantial increase in wetland habitat afforded permanent protection.

Alternative C – Public Use Focus

Same as Alternative A, except that an increase in public information and awareness could lead to changes in land use practices in tributary watersheds and reduced spread of invasive species, both of which could increase the positive effects to aquatic vegetation and wetland quality.

Alternative D – Wildlife and Integrated Public Use Focus

Save as Alternative B, except that an increase in public information and awareness could lead to changes in land use practices in tributary watersheds and reduce the spread of invasive species, both of which could increase the positive effects to aquatic vegetation and wetland quality.



Egret. Copyright by Sandra Lines

4.4.12 Floodplain Forest

Alternative A – No Action

Silver maple and ash will continue to dominate the floodplain forest because of poor regeneration of mast producing trees that are less tolerant of saturated soils, and the shading of pioneer species like cottonwood and willow. However, since even silver maple is not regenerating at self-sustaining rates, it is expected that openings in the forest cover will be invaded by herbaceous plants such as reed canary grass. The flood plain forest role as a contributor to carbon storage would be diminished as canopy densities decrease and conversions in vegetation type take place (UMRCC, 2002). Some increase in forest diversity and cover is expected from ongoing plantings on existing lands and on new habitat projects such as islands, as well as from the acquisition and forest management on acquired lands. In general, however, forest coverage, density, diversity, and structure is expected to continue to gradually decline under this alternative.

Alternative B – Wildlife Focus

Forest resources would be actively managed with the goal of maintaining a healthy, contiguous forest that spreads across wide stretches of the floodplain and contains sufficient diversity of tree species, sizes, and ages to provide a wide array of habitat structure and food (mast) resources. Completion of a forest inventory will enhance management planning and decisions. A Forest Management Plan will present goals and objectives for a proactive forest management program and lead to enhanced forest resources. Habitat projects and Environmental Pool Plan projects would restore and create islands that could eventually convert to mature forests. Invasive plant species would be monitored and actions would be taken to control the spread into forest openings. Overall, this alternative should result in a gradual increase in forest coverage, density, diversity, and structure.

Alternative C – Public Use Focus

Same as Alternative A, although an increase in public awareness of forest-related issues could lead to improved support and funding for forest management.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B, except like C, an increase in public awareness of forest-related issues could lead to improved support and funding for forest management.

4.4.13 Terrestrial Habitat/Grasslands

Alternative A – No Action

Under this alternative, there would be a modest increase in upland habitat permanently protected through land acquisition. Existing grassland habitat would be maintained through fire management, haying, and other tools, although species diversity may decline without integrated habitat management planning.

Alternative B – Wildlife Focus

There would be a substantial increase in upland habitat permanently protected through land acquisition. Grassland and other upland habitats could increase off-Refuge through more emphasis on private landowner assistance in tributary watersheds. Active management of grasslands and forests would occur through the preparation and implementation of a habitat management step-down plan. Oak-savanna and prairie habitats would likely increase due to more active management. Invasive plants would be monitored and reduced, with positive impacts to the diversity, density, and reproduction of native plants.

Alternative C – Public Use Focus

Same as Alternative A.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.5 Effects of Alternatives on Socioeconomic Parameters/Concerns

For complete economic data excerpted in this section, refer to James Caudill's November 2004 report entitled "The Economic Effects of the Upper Mississippi River National Wildlife and Fish Refuge: Baseline and Effects of Alternatives." The report is available at Refuge headquarters in Winona, or, is available on-line at <http://midwest.fws.gov/planning/uppermiss/index.html>.

4.5.1 Hunting

Alternative A – No Action

This alternative would have little effect on current hunting opportunities on the Refuge. A minimum of 191,644 acres (80.0 percent) of land and water would remain available to some form of hunting. This acreage will increase as new lands are acquired as part of the existing modest land acquisition program. These new lands, and the improvement of habitat quality from ongoing habitat projects, will likely result in an increase in some game populations and positively affect the hunting experience for many. Since this alternative involves little to no change in regulations and hunting methods and practices, hunters would find little disruption to their expectations and routines. For some waterfowl hunters, however, this alternative will not alleviate their concerns such as lack of a more equitable distribution of waterfowl, the feeling of exclusion in managed hunts and in areas where permanent blinds are allowed, and intense competition with other hunters in some areas. This alternative would continue to have a substantial positive economic impact as reflected in Table 28.

Alternative B – Wildlife Focus

This alternative would have several effects on current hunting opportunities on the Refuge. A minimum of 175,485 acres (73.2 percent) of land and water would remain available to some form of hunting, a decrease of about 16,000 acres from existing conditions. This decrease would result from new no hunting zones, retention of existing waterfowl hunting closed areas, and new waterfowl

Table 28: Annual Economic Effects of CCP Alternatives: Hunting¹

Impacts	Change from Alternative A			
	Alternative A: No Action	Alternative B: Wildlife Focus	Alternative C: Public Use Focus	Alternative D: Wildlife and Integrated Public Use Focus
Visitors	263,623	+ 26,362	+ 39,544	+ 26,362
Expenditures	\$5,203,988	+ \$520,399	+ \$780,598	+ \$520,399
Economic Output	\$6,425,261	+ \$642,526	+ \$963,789	+ \$642,526
Jobs	87	+ 9	+ 13	+ 9
Job Income	\$1,453,433	+ \$145,343	+ \$218,015	+ \$145,343
Federal and State Taxes	\$689,090	+ \$68,909	+ \$103,364	+ \$68,909

1.Caudill, 2004a

hunting closed areas. Although the areas open to hunting would decrease, the quality of hunting could increase, especially for waterfowl, since the Refuge would likely hold more birds in more areas for longer periods of time in the fall. The rate of land acquisition would increase under this alternative. Although some of this acquisition will occur in closed areas, it should still result in several thousand additional acres open to all forms of public hunting. In addition, improvement of habitat quality from ongoing habitat projects will likely result in an increase in some game populations and positively affect the hunting experience for many.

This alternative also involves several regulatory changes including the elimination of the use of permanent blinds, no entry into waterfowl hunting closed areas, electric motor only areas, shotshell limits during the waterfowl season, and elimination of managed hunts at Potter's Marsh and Blanding Landing in the Savanna District. These changes are likely to disrupt long-standing hunter expectations and hunting methods and practices and cause short-term confusion and frustration as hunters adjust to new closed areas and regulations. On some pools and pool locations, this could lead to less opportunity for some and reduced hunter visits. These impacts will be mitigated to some degree by information and education and lead time for implementation.

New regulations to prohibit open water hunting in portions of Pools 9 and 11 will have little impact to hunters since it is either prohibited by state regulation or not common practice. Some waterfowl hunters will view this alternative as helpful in alleviating their concerns about lack of a more equitable distribution of waterfowl, the feeling of exclusion in managed hunts and in areas where permanent blinds are allowed, and intense competition with other hunters in some areas. Electric motor only areas will allow a more primitive and less crowded hunting opportunity favored by some hunters.

The changes in the Lake Onalaska closed area boundary and the shotshell limit should have a positive impact for waterfowl by reducing crippling losses caused by firing line behavior that induces hunters to shoot at birds out of range. Some of this crippling loss reduction is negated by birds which land in closed areas and thus cannot be retrieved. The shotshell limit should also improve the hunting experience for many since it serves as an incentive to allow birds to work decoy sets.

Despite a reduction of area open to hunting, it is estimated that hunting visits overall will increase 10 percent under this alternative due to long-term trends in hunter visits, expected improvements to the hunting experience, and a better distribution of waterfowl and thus hunting opportunity. This alternative is predicted to have a corresponding increase in positive economic impact as reflected in Table 28.



Accessible observation deck. Cindy Samples, USFWS

Alternative C – Public Use Focus

This alternative would have several effects on current hunting opportunities on the Refuge. A minimum of 189,121 acres (78.9 percent) of land and water would remain available to some form of hunting, a decrease of about 2,500 acres from existing conditions. This decrease would result from new no hunting zones around new trails and other facilities for wildlife observation and other non-consumptive recreation. Since waterfowl hunting closed areas would not change substantially and entry still permitted, there would likely be little to no change in current waterfowl numbers and distribution.

This status quo in closed areas will be favored by some waterfowl hunters, but will not alleviate

the concerns of others over the unequal distribution of waterfowl on the Refuge. Like Alternative B, the rate of land acquisition would increase under this alternative, opening several thousand acres to all forms of public hunting. In addition, improvement of habitat quality from ongoing habitat projects will likely result in an increase in some game populations and positively affect the hunting experience for many.

This alternative also involves several regulatory changes including the elimination of the use of permanent blinds, establishment of electric motor only areas, implementing party spacing limits for waterfowl hunting, and eliminating managed hunts at Potter's Marsh and Blanding Landing in the Savanna District. These changes are likely to disrupt long-standing hunter expectations and hunting methods and practices and cause short-term confusion and frustration as hunters adjust to new regulations. This disruption will be mitigated to some degree by information and education and lead time for implementation. Some waterfowl hunters will view this alternative as helpful in alleviating their concerns such as the feeling of exclusion in managed hunts and in areas where permanent blinds are allowed, and intense competition with other hunters in some areas. Electric motor only areas will allow a more primitive and less crowded hunting opportunity favored by some hunters.

The changes in the Lake Onalaska closed area boundary and party spacing limit should have a positive impact for waterfowl by reducing crippling losses caused by firing line behavior which induces hunters to shoot at birds out of range. However, reducing the size of this closed area could also increase the number of hunters and negate some crippling loss reductions. The spacing limit should also improve the hunting experience for many by reducing crowding.

Despite a minor reduction of area open to hunting, it is estimated that hunting visits will increase 15 percent under this alternative due to overall long-term trends in hunter visits, no changes in waterfowl hunting closed areas, expected improvements to the hunting experience, and a better distribution of waterfowl and thus hunting opportunity. This alternative is predicted to have a corresponding increase in positive economic impact as reflected in Table 28.

Alternative D – Wildlife and Integrated Public Use Focus

This alternative would have several effects on current hunting opportunities on the Refuge. A minimum of 190,586 acres (79.5 percent) of land and water would remain available to some form of hunting, a decrease of just over 1,000 acres from existing conditions. This decrease would result from changes in waterfowl hunting closed areas (modification, elimination, and new), and new no hunting zones. Although the areas open to hunting would decrease slightly, the quality of hunting could increase, especially for waterfowl, since the Refuge would likely hold more birds in more areas for longer periods of time in the fall. As with alternatives B and C, the rate of land acquisition would increase under this alternative, opening several thousand acres to all forms of public hunting. In addition, improvement of habitat quality from ongoing habitat projects will likely result in an increase in some game populations and positively affect the hunting experience for many.

This alternative also involves several regulatory changes including the elimination of the use of permanent blinds, no fishing or motorized watercraft in waterfowl hunting closed areas, electric motor only areas, shotshell and hunting party spacing limits for waterfowl hunting, and changing procedures for managed hunts at Potter's Marsh and Blanding Landing in the Savanna District. These changes are likely to disrupt long-standing hunter expectations and hunting methods and practices and cause short-term confusion and frustration as hunters adjust to new closed areas and regulations. As in other alternatives, these changes could lead to less opportunity and fewer hunter visits on some areas of some pools. These impacts will be mitigated to some degree by information and education and lead time for implementation, or, as the case with permanent blinds, a phase out over time. New regulations to prohibit open water hunting in portions of Pools 9 and 11 will have little impact to hunters since it is either prohibited by state regulation or not common practice.

Some waterfowl hunters will view this alternative as helpful in alleviating their concerns such as lack of a more equitable distribution of waterfowl, the feeling of exclusion in managed hunts and in areas where permanent blinds are allowed, and intense competition with other hunters in some areas. Electric motor only areas will allow a more primitive and less crowded hunting opportunity favored by some hunters.

The establishment of a managed hunt area (Gibb's Lake) on the north end of the Lake Onalaska closed area (Barrel Blinds area) will cause a localized disruption to long-standing hunting practices and use in this area. Many hunters who routinely hunt this area will be displaced, although they will still have equal opportunity to hunt the area through the drawing process. On the other hand, the managed hunt will attract hunters who have avoided the area due to competition and unsportsmanlike behavior. Overall, the number of hunters using the Barrel Blinds area will likely decrease, while the quality of the hunting experience for participants will increase. The fee for the hunt will discourage some hunters from participating, either due to cost or principle, although this will be mitigated to some degree by offering free, family-day Saturdays, and opening the area on a first-come, first-secured basis after the first 45 days of the season.

Throughout the Refuge, the shotshell limit should have a positive impact for waterfowl by reducing crippling losses caused by firing line behavior which induces hunters to shoot at birds out of range. Like all other alternatives, some of this crippling loss reduction is negated by birds which land in closed areas and thus cannot be retrieved. The shotshell and hunting party spacing limits should also improve the hunting experience for many since it serves as an incentive to allow birds to work decoy sets and reduces confrontations between hunters. It is estimated that hunting visits will increase 10 percent under this alternative due to overall long-term trends in hunter visits, expected improvements to the hunting experience, and a better distribution of waterfowl and thus hunting opportunity. This alternative is predicted to have a corresponding increase in positive economic impact as reflected in Table 28.

Table 29: Annual Economic Effects of CCP Alternatives: Fishing¹

Impacts	Change from Alternative A			
	Alternative A: No Action	Alternative B: Wildlife Focus	Alternative C: Public Use Focus	Alternative D: Wildlife and Integrated Public Use Focus
Visitors	1,213,916	- 60,696	+ 121,392	+ 60,696
Expenditures	\$29,576,333	- \$1,478,817	+ \$2,957,633	+ \$1,478,817
Economic Output	\$36,223,053	- \$1,811,153	+ \$3,622,305	+ \$1,811,153
Jobs	483	- 24	+ 48	+ 24
Job Income	\$8,119,297	- \$405,965	+ \$811,930	+ \$405,965
Federal and State Taxes	\$3,884,811	- \$194,241	+ \$388,481	+ \$194,241

1.Caudill, 2004a

4.5.2 Fishing

Alternative A – No Action

This alternative would have little effect on current fishing opportunities on the Refuge. A minimum of 140,545 acres of water would remain available to year-round fishing and facilities and operations which support fishing (docks and piers, commercial fish floats, accesses) would remain the same. The improvement of habitat quality from ongoing habitat projects will likely result in an increase in some sport fish populations and positively affect the fishing experience for many. These gains could, however, be negated to some degree by continued sport fish stresses such as sedimentation and the effects of invasive species. Since this alternative involves little to no change in regulations that affect fishing, anglers would find little to no disruption to their expectations and routines. For some anglers, however, this alternative will not alleviate their concerns such as conflicts with recreational watercraft while fishing, and disruption from fishing tournament participants. This alternative would continue to have a substantial positive economic impact as reflected in Table 29.

Alternative B – Wildlife Focus

This alternative would have several effects on current fishing opportunities on the Refuge. A minimum of 104,716 acres of water would remain open to year-round fishing, a decrease of over 35,000 acres from existing conditions. This decrease would be due to the fall no-entry regulation for waterfowl hunting closed areas in this alternative. However, overall fishing opportunities would remain abundant and fishing would be permitted in closed areas during the peak spring, summer, and winter period. In addition to this seasonal closure, the type of fishing experience for some anglers would be affected by the elimination of commercial fish floats and by establishing electric motor only areas. Electric motor areas would remain open to fishing and change the use patterns and densities in these areas. Some anglers would find this welcome, both from a noise and disturbance standpoint, while others may resent the change from long-standing modes of use. The possible implementation of a boat ramp fee on Refuge-operated landings would be an added cost to many boat anglers. The fee would be minor in terms of fishing expenses and would not likely

discourage angling, especially given the number of non-Refuge boat ramps serving the river. However, some anglers could resent the added requirement and cost.

The improvement of habitat quality from ongoing habitat projects will likely result in an increase in some sport fish populations and positively affect the fishing experience for many. Increased efforts to improve water quality through work with private landowners in tributary watersheds, and more emphasis on control of aquatic invasive species, could also result in increases in sport fish populations and thus fishing success.

With restrictions to fishing in waterfowl closed areas, electric motor areas, and the elimination of commercial fish floats, combined with no increase in fishing-related facilities, fishing visits are predicted to decrease 5 percent under this alternative. This alternative is predicted to have a corresponding negative economic impact as reflected in Table 29.

Alternative C – Public Use Focus

This alternative would have several effects on current fishing opportunities on the Refuge. Like alternative A, a minimum of 140,545 acres of water would remain open to year-round fishing. The type of fishing experience for some anglers would be affected by establishing electric motor only areas. Electric motor areas would remain open to fishing and change the use patterns and densities in these areas. Some anglers would find this welcome, both from a noise and disturbance standpoint, while others may resent the change from long-standing modes of use. Existing commercial floats would remain and proposals for a new float solicited, creating additional fishing opportunity for persons without boats or who prefer this type of fishing. A new fish float would have a positive, but local, economic effect. Five additional fishing docks or piers, an additional boat ramp, and other access points would provide or facilitate fishing opportunities. The implementation of a seasonal Refuge Recreation Use Permit system with fee and a boat launch fee at Refuge ramps would be an added cost to many boat anglers. The fee for the permit would be minor in terms of fishing expenses and would not likely discourage angling, especially given the number of non-Refuge boat ramps serving the river, or the number of anglers who would not need a Recreation Use Permit since they do not camp or otherwise use Refuge lands when fishing. However, some anglers could resent the added requirement and cost.

The improvement of habitat quality from ongoing habitat projects will likely result in an increase in some sport fish populations and positively affect the fishing experience for many. Increased efforts to improve water quality through work with private landowners in tributary watersheds, and more emphasis on control of aquatic invasive species, could also result in increases in sport fish populations and thus fishing success.

Fishing visits are expected to increase 10 percent under this alternative based on long-term trends of angling visits, improvements in habitat and sport fish populations, and additional fishing-related facilities. This alternative is predicted to have a corresponding increase in positive economic impact as reflected in Table 29.

Alternative D – Wildlife and Integrated Public Use Focus

This alternative would have several effects on current fishing opportunities on the Refuge. A minimum of 110,611 acres of water would remain open to year-round fishing, a decrease of about 30,000 acres. This decrease would be due to the fall no-fishing regulation for waterfowl hunting closed areas in this alternative. However, overall fishing opportunities would remain abundant and fishing would be permitted in closed areas during the peak spring, summer, and winter period. In addition to this seasonal closure, the type of fishing experience for some anglers would be affected by establishing electric motor only areas. Electric motor areas would remain open to fishing and change the use patterns and densities in these areas. Some anglers would find this welcome, both from a noise and disturbance standpoint, while others may resent the change from long-standing modes of use. Three additional fishing docks or piers, an additional boat ramp, and other access points would

provide or facilitate fishing opportunities. The possible implementation of a boat ramp fee on Refuge-operated landings would be an added cost to many boat anglers. The fee would be minor in terms of fishing expenses and would not likely discourage angling, especially given the number of non-Refuge boat ramps serving the river. However, some anglers could resent the added requirement and cost.

The improvement of habitat quality from ongoing habitat projects will likely result in an increase in some sport fish populations and positively affect the fishing experience for many. Increased efforts to improve water quality through work with private landowners in tributary watersheds, and more emphasis on control of aquatic invasive species, could also result in increases in sport fish populations and thus fishing success.

Despite restrictions to fishing in waterfowl closed areas and electric motor areas, fishing visits are expected to increase 5 percent under this alternative based on long-term trends in angling visits, improvements in fish habitat, and additional fishing-related facilities. This alternative is predicted to have a corresponding increase in positive economic impact as reflected in Table 29 (Caudill, 2004a).

4.5.3 Fishing Tournaments

Alternative A – No Action

This alternative would have little direct effect on fishing tournaments since the Refuge would continue to defer to the states for all permitting. Some increase in tournaments would be expected from improvement to fish habitat through ongoing habitat projects.

Alternative B – Wildlife Focus

The size, number, and location of fishing tournaments would likely change under this alternative since the Refuge would issue special use permits in addition to the state-required permits. Impacts to sensitive habitat and fish and wildlife areas would be lessened, and conflicts between fishing tournaments and between general anglers could be reduced by time and space management of tournaments. Tournament sponsors and organizers would face another regulatory requirement, but the effects of this would be mitigated by a process that meshes the state and Refuge permit process and stipulations.

No specific economic analysis was done for fishing tournaments since the parameters for management have yet to be determined. However, tournaments were accounted for in the economic analysis of fishing as a whole and a modest decline in economic activity attributed to fishing tournaments is predicted since fewer tournaments are likely to occur.

Alternative C – Public Use Focus

The impacts of this alternative are predicted to be similar to Alternative A. Although under this alternative the Refuge would review state-issued permits for tournaments on the Refuge, this review would likely modify only the timing and spacing of tournaments. The implementation of a Refuge Recreation Use Permit could affect some tournament anglers who also camp or otherwise use Refuge lands, but the added cost would be minor compared to expenditures for tournament fishing.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B.

4.5.4 Commercial Fishing

Alternative A – No Action

This alternative would have little effect on current commercial fishing operations on the Refuge since management and oversight would continue to be done by the states. The improvement of

habitat quality from ongoing habitat projects will likely result in an increase in some fish populations and positively affect the commercial fishing harvest. Since this alternative involves no change in regulations that affect commercial fishing, operators would find little to no disruption to their expectations and routines. The current number of commercial fishermen (527 based on 4-year average) and gross value of catch (\$1.7 million) would remain the same, subject to the variability of fish populations and market.

Alternative B – Wildlife Focus

Under this alternative, an increase in fish habitat quality through increased habitat projects, and emphasis on invasive fish harvest could account for a 10 percent increase in catch. This would result in an estimated annual increase of \$170,000 in total ex vessel value (the price paid to the commercial angler dockside) for commercial fishing in pools 4-14. This assumes no change in ex vessel prices and catch success rate. Commercial fishermen would find additional restrictions to where and when they could fish due to the no-entry in waterfowl hunting closed areas under this alternative. This could disrupt some operations and displace commercial fishing operators to other areas of the Refuge from October 1 to the end of the respective state regular duck season.

Alternative C – Public Use Focus

Same as Alternative A.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B since the no fishing restriction for waterfowl hunting closed areas is in effect a no-entry restriction for commercial fishing.

4.5.5 Fishing Floats

Alternative A – No Action

This alternative would have no impact to commercial fish float operations since the current program would continue. Collective gross revenue from the existing four fish floats is estimated at \$125,000 per year. Since some fish float operations have experienced difficulty meeting current permit requirements, such as Coast Guard licensing for transporting the public, their period of operation has fluctuated and gross revenues can change from year to year.

Alternative B – Wildlife Focus

This alternative would eliminate all four floats currently operating on the Refuge. Eliminating the floats would create a direct economic hardship on existing owners/operators by the loss of approximately \$125,000 in gross revenues, and have a negative local economic effect to food service, lodging, and fishing-related businesses near the floats. There could also be an emotional impact to owners and families from the closing of the floats, some of which have been family-operated businesses for decades. The effect of the economic losses would be minor compared to the overall positive economic impacts of fishing on the Refuge. Closing the fish floats could also reduce overall fishing visits to the Refuge, tempered somewhat by alternative fishing opportunities such as guide services, boat rental, dock, and shore fishing. Clients who have become accustomed to the fish float service would likely find this alternative disruptive and frustrating in the short-term as they adjusted to alternative fishing methods or areas. Boat anglers who fish in the vicinity of the floats may find their removal advantageous due to reduced competition for space and fish.

Alternative C – Public Use Focus

Same as Alternative A, except that a new fish float in the Savanna District would provide a proportionate increase in this type of angling visit and positive economic impact. New standards and permits would have a modest economic impact to current operations due to required infrastructure improvements and a higher annual fee to help offset Refuge administrative costs.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative A, although a portion of the impacts of Alternative B could be realized if current fish floats failed to meet new standards and were phased out. Also, in Alternative C, new standards and permits would have a modest economic impact to current operations due to required infrastructure improvements and a higher annual fee to help offset Refuge administrative costs.



*Ice fishing program at Upper Mississippi River NW&FR.
USFWS*

4.5.6 Interpretation and Environmental Education

Alternative A – No Action Alternative

Under this alternative, the current trend of modest increases in interpretive and environmental education opportunities would likely continue. There would continue to be a disproportionate level of opportunity in those districts of the Refuge which have visitor services specialists and/or facilities, namely Savanna and La Crosse Districts. This alternative would not meet the demand for interpretation and environmental education as gauged by inquiries and growing tourism visits to the Refuge area. There is no analysis of

economic impacts related to interpretation and education for this or other alternatives since these uses are not drivers for visitation and expenditures.

Alternative B – Wildlife Focus Alternative

Under this alternative, there would be a continual decline in interpretive and environmental education opportunities as the emphasis of staff and programs is shifted to more wildlife-based work. Identified staff needs for interpretation and environmental education would be a lower priority and likely not filled for many years. Facilities related to interpretation and environmental education would remain the same as current. This and staffing priorities would increase the gap between public demand and Refuge capability, and visits for interpretation and environmental education would decline an estimated 25 percent. Decreased visitation would reduce some disturbance to wildlife and habitat, although this is expected to be negligible since existing facilities are not in or near sensitive areas. On the other hand, this alternative could have long-term consequences in terms of public and political support which could negatively impact projects and funding for improving the quality of fish and wildlife habitat.

Alternative C – Public Use Focus Alternative

Interpretive and environmental education visits could increase by 65 percent with this alternative due to increases in staff assigned to interpretation and environmental education and an increase in related facilities such as signing, visitor contact areas in offices, and a major visitor center in the Winona/La Crosse area. Increased facilities and visitation would cause some displacement of habitat and increase some disturbance to wildlife, although this is expected to be minor given the size of the Refuge and by avoiding sensitive wildlife locations and habitat. This alternative could have long-term positive consequences in terms of public and political support which could positively impact projects and funding for improving the quality of fish and wildlife habitat.

Alternative D – Wildlife and Integrated Public Use Alternative

Interpretive and environmental education opportunities could increase by 50 percent with this alternative (no major visitor center), and impacts would be similar, but proportionately less than, Alternative C.

Table 30: Annual Economic Effects of CCP Alternatives: Wildlife Observation¹

Impacts	Change from Alternative A			
	Alternative A: No Action	Alternative B: Wildlife Focus	Alternative C: Public Use Focus	Alternative D: Wildlife and Integrated Public Use Focus
Visitors	307,013	+ 0	+ 61,403	+ 61,403
Expenditures	\$4,063,292	+ 0	+ \$812,658	+ \$812,658
Economic Output	\$4,968,614	+ 0	+ \$993,723	+ \$993,723
Jobs	68	+ 0	+ 14	+ 14
Job Income	\$1,071,484	+ 0	+ \$214,297	+ \$214,297
Federal and State Taxes	\$522,657	+ 0	+ \$104,531	+ \$104,531

¹Caudill, 2004a

4.5.7 Wildlife Observation and Photography

Alternative A – No Action

Under this alternative, the current trend of increases in wildlife observation and photography visits would likely continue despite no change in facilities or programs. Ongoing habitat improvements and land acquisition would increase the quality of opportunities for these uses. However, this alternative would not meet the demand for facilities related to observation and photography (trails, tour routes, overlooks, blinds, etc.) as gauged by inquiries, past visitation trends, and growing tourism visits to the Refuge area. This alternative would continue to have a substantial positive economic impact as shown in Table 30.

Alternative B – Wildlife Focus

Impacts would be the same as Alternative A, although an increased emphasis on habitat improvements and land acquisition should improve the quality of wildlife observation and photography in certain areas. However, existing facilities could degrade more quickly as staff is directed to more important fish and wildlife related work. Economic impacts would likely be the same as the No Action or Current Direction Alternative.

Alternative C – Public Use Focus

Under this alternative, wildlife observation and photography visits are estimated to increase 20 percent due to habitat improvements, accelerated land acquisition, and a marked increase in related facilities (trails, tour routes, overlooks, blinds, etc.). Additional staff would be focused on public use programs and facilities which could enhance the quality and quantity of observation and photography opportunities. Increased facilities and visitation would cause some displacement of habitat and increase some disturbance to wildlife, although this is expected to be minor given the size of the Refuge and by avoiding or minimizing intrusion into important wildlife locations and habitat. This alternative could have long-term positive consequences in terms of public and political support which could positively impact projects and funding for improving the quality of fish and wildlife habitat. This alternative is predicted to have a corresponding increase in positive economic impact as reflected in Table 30.

Table 31: Annual Economic Effects of CCP Alternatives: Recreational Boating, Camping and other Beach-related Uses¹

Impacts	Change from Alternative A			
	Alternative A: No Action	Alternative B: Wildlife Focus	Alternative C: Public Use Focus	Alternative D: Wildlife and Integrated Public Use Focus
Visitors	1,362,851	- 203,065	+ 2,044	+ 2,044
Expenditures	\$34,673,216	- \$5,166,309	+ \$52,010	+ \$52,010
Economic Output	\$42,266,199	- \$6,297,664	+ \$63,400	+ \$63,400
Jobs	535	- 80	+ 1	+ 1
Job Income	\$9,044,582	- \$1,347,643	+ \$213,567	+ \$213,567
Federal and State Taxes	\$4,558,847	- \$679,268	+ \$6,838	+ \$6,838

1.Caudill, 2004a

Alternative D – Wildlife and Integrated Public Use Focus

Under this alternative, the impacts would be similar to Alternative C due to similar habitat improvements, accelerated land acquisition, and similar additions to facilities related to observation and photography. Table 30 (Caudill, 2004a).

4.5.8 Recreational Boating, Camping and Other Beach-Related Uses

Alternative A – No Action

Under this alternative, recreational boating, camping and other beach-related recreation would continue under current regulations and visits would continue to increase based on past use data and trends. These uses would continue to provide substantial economic impacts as displayed in Table 31. Overall, this alternative would have virtually no impact on the opportunities for recreational boating, camping, picnicking, swimming, and other beach-related uses. However, as visits continue to rise, the quality of the experience is likely to diminish due to crowding, unlawful and unruly visitor behavior, and litter and human waste.

Alternative B – Wildlife Focus

Under this alternative, visits for recreational boating, camping and other beach-related uses could decline by an estimated 15 percent as managers follow a “closed-unless-open” policy on Refuge shoreline and beach areas. Visitors would find fewer areas open to camping under this alternative as managers more assertively protect wildlife and habitat values of shorelines, beaches, islands, and backwaters. Space restrictions, and to a lesser degree the lack of beach maintenance (shaping and sand replenishment) would force visitors into less area and perhaps lead to more crowding. New regulations dealing with human waste would help improve the camping and beach use experience. Also, tighter regulations on the use of alcohol would help lessen the amount of unlawful and unruly behavior and improve the recreation experience for many users.

Recreation would be prohibited in waterfowl hunting closed areas and some visitors will find this change annoying and disruptive to long-standing boating routes or general fall boating, sailing, or canoeing and kayaking. However, this restriction would be in the fall when boating and other water and beach-related recreation is low. Visits for silent watercraft recreation (canoes and kayaks) would increase an estimated 10 percent with the creation of many electric motor only areas. Some users of power watercraft, on the other hand, will find these areas a nuisance and a reduction in area open to their traditional mode of sport and transportation. However, the electric motor only areas represent less than 15 percent of the surface water area of the Refuge so ample area would remain for the use of combustion engine-powered watercraft.

More frequent pool drawdowns to improve habitat would have a periodic and seasonal (summer) impact on recreational boating access and travel corridors, although the main channel of the river would remain deep enough for unrestricted travel. Drawdowns would also expose additional sandbar and beach areas for recreational use. The addition of slow, no-wake zones would slow travel times on a few access corridors, but this should have no impact on overall recreational boating.

Changes in areas open to certain uses and new regulations are likely to disrupt long-standing visitor expectations and practices and cause short-term confusion and frustration when visitors see area restrictions and new regulations. This disruption will be mitigated to some degree by information and education and lead time for implementation. Overall, this alternative will have a negative economic impact commensurate with the expected reduction in visitors engaged in recreational boating and beach-related recreation. This impact is summarized in Table 31.

Alternative C – Public Use Focus

Under this alternative, areas currently open to recreational boating, camping and other beach-related recreation would remain unchanged and visits would continue to increase based on past use data and trends. New boat access points would facilitate visits to some areas of the Refuge. New regulations dealing with human waste would help improve the camping and beach use experience. Also, tighter regulations on the use of alcohol would help lessen the amount of unlawful and unruly behavior and improve the recreation experience for many users. The requirement of a for-fee Recreation Use Permit for visitors who camp, anchor, moor, or beach watercraft on Refuge lands would help improve maintenance of areas and public safety through increased law enforcement patrols. This would in turn improve the quality of the experience for many users. However, many visitors, accustomed to free use of the Refuge, may resent the user fee. The fee is not expected to alter recreational use or visits to an appreciable degree.

Visits for silent watercraft recreation (canoes and kayaks) would increase an estimated 15 percent with the creation of 15 electric motor only areas. These areas would also be open to primitive camping and appeal to a certain segment of the public seeking an alternative river backwater experience. Like Alternative B, some users of power watercraft, on the other hand, will find these areas a nuisance and a reduction in area open to their traditional mode of sport and transportation. However, the electric motor only areas in this alternative represent less than 10 percent of the surface water of the Refuge, so ample area would remain for the use of engine-powered watercraft. Impacts from pool drawdowns and slow, no wake zones would be similar to Alternative B.

Like Alternative B, changes in areas open to certain uses and new regulations are likely to disrupt long-standing visitor expectations and practices and cause short-term confusion and frustration when visitors see area restrictions and new regulations. This disruption will be mitigated to some degree by information and education and lead time for implementation. This alternative would result in a modest increase in economic activity and impact as reflected in Table 31 (Caudill, 2004a).

Alternative D – Wildlife and Integrated Public Use Focus

Under this alternative, visits for recreational boating, camping and other beach-related uses would remain about the same even though managers may restrict use on certain beach areas under an

“open-unless-closed” policy. The number of restricted or closed shorelines or islands is expected to be small, and given the size of the Refuge, visitors should continue to have ample open areas. Visitors would find fewer areas open to camping under this alternative as backwaters, except in electric motor only areas, would be closed to camping. However, this should have little impact since a vast majority of camping occurs adjacent to the main river channel. New boat access points would facilitate visits to some areas of the Refuge. New regulations dealing with human waste and a clear beach maintenance policy would help improve the camping and beach use experience. Also, tighter regulations on the use of alcohol would help lessen the amount of unlawful and unruly behavior and improve the recreation experience for many users.

Visits for silent watercraft recreation (canoes and kayaks) would increase an estimated 15 percent with impacts similar to Alternative C. Impacts from pool drawdowns and slow, no wake zones would be similar to Alternatives C and B.

Like Alternatives C and B, changes in areas open to certain uses and new regulations are likely to disrupt long-standing visitor expectations and practices and cause short-term confusion and frustration when visitors see area restrictions and new regulations. This disruption will be mitigated to some degree by information and education and lead time for implementation. This alternative would result in a modest increase in economic activity and impact as reflected in Table 31.

4.5.9 Commercial Guiding and Tours

Alternative A – No Action

Guiding activities would continue and likely increase above the current estimated 15 guides operating on the Refuge. Since accurate information on guiding is not available due to inconsistent administration by the Refuge, the number of clients and economic impact is unknown. There would continue to be some conflict with the general public in some areas as guides and clients compete for the same space and resource.

Alternative B – Wildlife Focus

Under this alternative guiding would be eliminated on the Refuge. This would result in significant economic loss for guides and could result in a small decline in the number of visitors to the Refuge. The extent of these impacts is unknown due to incomplete data on guide activities. Any conflicts between guides, clients, and the general public would be eliminated under this alternative.

Alternative C – Public Use Focus

Same as Alternative A except that consistent Refuge policy and procedures for issuing permits, along with anticipated time and space restraints, would reduce conflicts with the general public and between guides. Some existing guides may not be able to meet permit requirements and lose the opportunity to guide on the Refuge.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative C.

4.5.10 Refuge Access

Alternative A – No Action

Under this alternative, access to the Refuge from Refuge-administered accesses would remain the same. Since there are 222 boat landings and various other canoe, walk-in, and informal accesses to the river in and around the Refuge, this alternative will have no impact on overall public access to the Refuge.

Alternative B – Wildlife Focus

Same as Alternative A except the implementation of a self-service boat launch fee at Refuge-administered boat landings would improve access maintenance. This fee could result in a modest decline in the use of Refuge boat landings.

Alternative C – Public Use Focus

Under this alternative, 7 new and 1 improved accesses would improve access to the Refuge in certain areas and foster a variety of wildlife-dependent public uses. A boat launch fee would have the same impacts as in Alternative B.

Alternative D – Wildlife and Integrated Public Use Focus

Same as C except there would be 1 fewer canoe landing with a commensurate impact to access opportunity.

4.5.11 Control of Dogs and Other Domestic Animals

Alternative A – No Action

Current, restrictive dog and other domestic animal regulations (must be confined except for dogs during hunting season) would continue to cause confusion and lack of compliance. The public would continue to allow dogs to run free on islands, beaches, and at public access points and owners would be at risk of citation at a Refuge Officer's discretion. Disturbance to wildlife and other visitors would continue at levels related to the effort given to enforcement of the regulation.

Alternative B – Wildlife Focus

This alternative would clarify the domestic animal regulation. The regulation change would likely be viewed negatively by many dog owners who have become accustomed to using the Refuge for training or letting their animals run free. There will also be some short-term confusion with a new regulation, but this will be mitigated by information, education, and lead time for implementation. Disturbance to wildlife and other visitors would decline.

Alternative C – Public Use Focus

Under this alternative, public acceptance may be greater due to a more liberal regulation which does not require dogs to be constrained, only controlled. This regulation change would likely be viewed positively by many dog owners, especially those who have become accustomed to using the Refuge for training or letting their animals run free. Disturbance to wildlife and the public would stay the same on most areas of the Refuge, but decrease at public access areas and trails. However, enforcement of the regulation would pose a difficulty for Refuge Officers due to different interpretations of control, proximity, and other terms, negating some of the decrease in disturbance.

Alternative D – Wildlife and Integrated Public Use Focus

Under this alternative, public acceptance will be mixed. Some will view the new regulation as more restrictive than current practice, while others will view it as more liberal. Disturbance to wildlife and the public would decrease throughout the Refuge, but particularly at public accesses and other facilities. Seasonal restrictions on allowing dogs to be free will provide protection to wildlife during the critical nesting and/or rearing season. Enforcement of the regulation and understanding by the public would improve due to clear and specific regulation language.

4.5.12 Property Taxes

For complete data excerpted in this section, refer to James Caudill's report "Impact of Management Alternatives on Local Tax Revenue, Upper Mississippi River National Wildlife and Fish Refuge" dated April, 2004. The report is available at Refuge headquarters in Winona, or is available on-line at <http://www.fws.gov/midwest/planning/uppermiss/index.html>.

Alternative A – No Action

Under this alternative the rate of land acquisition would remain the same. The Refuge would acquire around 200 acres a year, or 3,000 acres by 2020. Total revenue sharing payments made by the Service to the counties are estimated to increase from \$90,000 in 2003 to \$297,000 in 2020. The estimated annual tax revenue loss from acquired acres in 2020 is \$68,000. This loss in tax revenue will be mitigated to varying degrees by rate of acquisition over a number of years, acquisition over a broad landscape encompassing several states and many counties, increases in other tax revenues from Refuge operations and recreation expenditures, and predicted increase in property values, and thus assessed values, adjacent to Refuge lands (see section 4.2.5 of this chapter).

Alternative B – Wildlife Focus

Under this alternative the rate of land acquisition would increase to 1,000 acres a year, or 15,000 acres by 2020. Total revenue sharing payments are estimated to increase from \$90,000 in 2003 to \$320,000 in 2020. The estimated annual tax revenue loss from acquired acres in 2020 is \$340,000. Like Alternative A, this loss in tax revenue will be mitigated to varying degrees by rate of acquisition over a number of years, acquisition over a broad landscape encompassing several states and many counties, increases in other tax revenues from Refuge operations and recreation expenditures, and predicted increase in property values, and thus assessed values, adjacent to Refuge lands (see section 4.2.5 of this chapter).

Alternative C – Public Use Focus

Same as Alternative B, Wildlife Focus.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B, Wildlife Focus.

4.5.13 Refuge Administration and Operations

Alternative A – No Action

Under this alternative, the overall annual Refuge budget is expected to increase in accordance with inflation adjustments, but Refuge staffing levels would remain the same as current, or 37 full-time employees. With levels of public use and interest continuing to rise, meeting the information needs of the public will likely fall short of public expectation in terms of personal contact, programs, leaflets, and media work. Coordination with the various state and federal agencies and non-government organizations will continue at the current level, resulting in gaps in Refuge presence on such issues as forestry, fisheries, and biological monitoring.

Refuge offices and maintenance facilities would remain the same, and inadequate in terms of public accessibility, information, and programs, and in terms of employee productivity and recruitment. Some offices will continue to have unresolved structural safety issues, while inadequate maintenance and storage will continue to negatively affect efficiency of field operations and condition of heavy equipment and vehicles.

Annual salary and operations expenditures will continue to have a positive economic impact, with current economic output estimated at \$8.3 million (see Caudill, 2004).

Alternative B – Wildlife Focus

Under this alternative, the overall annual Refuge budget would increase substantially, mainly due to increases in staffing to an eventual 54.5 full-time equivalents. This increase in staffing would dramatically increase biological monitoring, soundness of decisions, and direct habitat work. Personal service to the public and coordination with the various state and federal agencies and non-government organizations would increase markedly, especially in terms of habitat and biological programs which would be the priority under this alternative.

Refuge offices would remain the same, with most inadequate in terms of public accessibility, information, and programs, and in terms of employee productivity and recruitment. Maintenance and storage facilities would be replaced, improving the efficiency of field operations and maintaining heavy equipment and vehicles in better condition.

Annual salary and operations expenditures will result in an increased positive economic impact commensurate with increases. Staff salary expenditures alone could increase approximately 40 percent by the end of the planning period in 2015, resulting in a similar economic output increase.

Alternative C – Public Use Focus

Same as Alternative B, except that a priority on filling visitor services-related staff and the construction of new offices and a major new visitor center would dramatically increase public accessibility, information, and programs.

Alternative D – Wildlife and Integrated Public Use Focus

Same as Alternative B, except that construction of new offices (no major visitor center) would increase public accessibility, information, and programs, and improve employee productivity and recruitment. In addition, staffing would increase to an eventual 56.5 full-time equivalents.

4.6 Cumulative Impacts

4.6.1 Cumulative Impacts – Physical Environment

Alternatives B, C, and D, and to a lesser extent A, call for increased attention to habitat restoration and/or enhancement projects, floodplain and adjacent land acquisition, and improvement in water quality in terms of both chemistry and reduced sediment. Collectively and over time, these actions will improve the ability of the river environment to process nutrients and store carbon, and along with other basin-wide regulations and initiatives, contribute to the improvement of hypoxia in the Gulf of Mexico. Physical changes through projects will restore islands, deflect sediment from backwaters, and deepen sediment-filled channels, resulting in a more diverse and dynamic river geomorphology. These changes will help reverse a trend to more-or-less static geomorphology, a trend which started when the locks and dams went into operation in the 1930s. Work on the river within the Refuge also influences work on the river upstream and downstream of the Refuge, and thus can have a larger cumulative effect on the physical environment.

Although rates and amounts of sediment entering the Refuge may be reduced over time, none of the alternatives will adequately address the movement of sediments to the mouth of the Mississippi. Thus, the actions in the alternatives will not cumulatively improve the continued deficit of sediment on the Mississippi River delta.

All alternatives, to slightly varying degrees, emphasize maintaining the integrity of the Refuge boundary and conserving the scenic beauty. Given the size and length of the Refuge, actions taken in the alternatives to ensure long-term forest health, acquire floodplain and bulflands, and reduce encroachment, will serve as a model for land use planning and zoning adjacent to the Refuge. In addition, when actions on the Refuge are combined with actions of the states, non-profit organizations, and private landowners, there can be measurable progress in stemming the rate or type of development which detracts from the scenic beauty of the Upper Mississippi River Valley.

4.6.2 Cumulative Impacts – Biological Environment

Although the degree of habitat quantity and quality improvement is different under the alternatives, all should continue to improve fish and wildlife habitat, and thus populations. For some species or species-groups which have limited habitat options elsewhere (for example mussels and paddlefish), this improvement will be important to their overall populations and genetic diversity.

For migratory birds, the Refuge may likely grow in importance due to its size and scope. Reduced habitat for migrating waterfowl in the Midwest, for example, has made the Refuge a critically important stop for large portions of the continent's canvasback and tundra swans. In this regard, alternatives A and C, with virtually unchanged Waterfowl Hunting Closed Areas, may not meet the future needs of these birds should feeding habitat in existing closed areas decline. It is unknown whether these birds would find adequate mid-migration habitat elsewhere, and alternatives A and C could have very negative cumulative impacts on these continental populations. On the other hand, alternatives B and D create new and more attractive closed areas which would provide insurance for these birds in the event of feeding habitat collapses in any given pool.



Lily flowers. Copyright Sandra Lines

Habitat improvements under the alternatives should also benefit rare and declining species, and species listed as threatened or endangered. Along with conservation actions for these species on other public and private lands, the Refuge actions across all alternatives, but especially B and D, will have a positive cumulative impact. For example, the Refuge has 136 nesting pair of bald eagles, and provides winter habitat for a peak population of 1,000 eagles, with a trend that continues upward. Thus, the Refuge can positively contribute to the case for delisting the bald eagle. For some species, the Refuge may provide an important reservoir for population expansion on suitable habitat off-refuge that may become available in

the future. On the other hand, maintaining habitat quality and quantity could prove important in expansion or recovery of species. An example would be the endangered whooping crane. Although population restoration efforts were started elsewhere, some birds are now using the Refuge and may in the future breed, thus adding to wild populations and eventual recovery.

Alternatives A and C provide no increase in the control of invasive plants and animals, and infestations are expected to continue to increase. This will not only affect habitat and other species on the Refuge, but could speed the spread of invasives to previously un-infested areas off-Refuge. On the other hand, Alternative B and D stress more aggressive action which could help keep invasives in check beyond the Refuge.

Alternatives B and D also have a strong, biological monitoring component, with increases in species and habitats surveyed, research, and coordination with others. This increased information will not only aid decision making that benefits fish and wildlife on the Refuge, but adds to the body of knowledge collected by other agencies which can affect resource decision-making over a broader landscape.

Table 32: Summary of Annual Economic Effects of CCP Alternatives on Recreational Use¹

Impacts	Alternative A: No Action	Change from Alternative A		
		Alternative B: Wildlife Focus	Alternative C: Public Use Focus	Alternative D: Wildlife and Integrated Public Use Focus
Visitors	3,168,483	- 237,399	+ 224,383	+ 150,505
Expenditures	\$73,516,829	- \$6,124,727	+ \$4,602,899	+ \$2,863,884
Economic Output	\$89,883,127	- \$7,466,291	+ \$5,643,217	+ \$3,510,802
Jobs	1,173	- 95	+ 76	+ 48
Job Income	\$19,688,796	- \$1,608,265	+ \$1,457,809	+ \$979,172
Federal and State Taxes	\$9,655,675	- \$804,600	\$603,214	\$374,519

1.Caudill, 2004a

4.6.3 Cumulative Impacts – Socioeconomic Environment

A variety of objectives in alternatives B, C, and D will have varying degrees of impact on recreational use of the Refuge. Earlier sections detailed specific impacts on individual uses such as hunting, fishing, wildlife observation, and general recreation. Cumulatively, each alternative has a different economic impact since it affects the level of public use. Table 32 summarizes this cumulative impact by alternative.

Each alternative takes a different approach to managing the variety of recreational uses that occur on the Refuge, ranging from status quo (Alternative A) to an integrated approach (Alternative D) which seeks to conserve wildlife and habitat while providing a diversity of recreational opportunities for a broad cross-section of visitors. These varying alternatives will have cumulative impacts given that demand for nearly all recreation is expected to grow while the amount of Refuge space and natural resources is relatively finite.

In Alternative A, current uses would continue without much change. Eventually, the level and means of use would change the nature of the experience for many visitors, and many would choose to either forgo certain recreation due to crowding or behavior issues, or go elsewhere. Given that the Refuge provides opportunity for 3.7 million visitors, this shift could put additional strains on other public lands and have a negative local and regional economic effect, or diminish the Refuge's contribution to the Refuge System mission of providing fish and wildlife for the benefit of the American people as a whole. Alternative B might have the same effect by being perceived as too restrictive in terms of recreation, and Alternative C might have the same effect for reasons similar to Alternative A. Alternative D attempts to strike that reasonable balance to ensure that the Refuge remains a destination of choice for both wildlife and people. If successful, this integrated approach may prove more sustainable and have positive, long-term natural resource, social, and economic impacts both on the Refuge and beyond.

Alternatives B, C, and D also involve an approximate 50 percent increase in the Refuge's base operations and maintenance budget over the next 15 years, plus additional maintenance and construction funding for new facilities. Although budgets are impossible to predict, this increase could impact operations funding at other refuges and wetland management districts in the Region if it came from existing allocations. This would result in delaying or forgoing habitat and facility improvements and other work at these stations, although the change would be small at any particular station.

Working relationships with the states, Corps of Engineers and others should improve in terms of responsiveness to inquiries and speed of joint projects under alternatives B and D, and to a lesser extent under alternative C. This improvement would be mainly the result of increased staffing in key areas such as biology, fisheries, and forestry. Since the Mississippi River and the Refuge is multi-jurisdictional in many aspects, more effective coordination will have wide-ranging positive impacts on fish and wildlife and public use programs and opportunities. Many programs such as Environmental Management Program and pool-wide drawdowns involve new approaches and techniques which have application elsewhere, and can have a positive cumulative effect on how agencies work with large river systems.

Overall coordination and communication with the general public should improve under alternatives C and D due to new staff positions dealing with public use and public information. Since some may oppose changes in one or more of the alternatives, or likewise support them, the cumulative impact on public perception of the Refuge and the Fish and Wildlife Service could be negative or positive. More emphasis on public education and information in alternatives C and D should foster more understanding and appreciation of resource issues and needs, and could lead to increased political support and funding which could positively affect fish and wildlife resources on the Refuge and the Mississippi River as a whole. Increased outreach of these alternatives could also positively impact land use decisions outside of the Refuge by local governments and private landowners, and thus lead to increased fish and wildlife populations over a broader area.

Table 33: Summary of Alternative Impacts

Parameter ¹	Alternative A: No Action	Alternative B: Wildlife Focus	Alternative C: Public Use Focus	Alternative D: Wildlife and Integrated Public Use (Preferred Alternative)
Physical				
Water Quality	3	4	3	4
Sedimentation	3	4	4	4
Geomorphology	3	4	3	4
Hydrology and Water Level Management	3	4	3	4
Landscape Considerations	2	4	3	5
Biological				
Threatened and Endangered Species	3	4	2	4
Waterfowl	2	4	2	4
Other Migratory Birds	2	4	2	4
Sport Fish	4	5	4	5
Other Fish	2	4	3	4
Freshwater Mussels	2	4	2	4
Reptiles and Amphibians	3	4	2	4
Control of Invasive Species	1	4	1	4
Invertebrates	3	4	3	4
Mammals	3	4	3	4
Aquatic Vegetation/ Wetlands	3	4	3	4
Floodplain Forest	2	4	2	4
Terrestrial Habitat/ Grasslands	3	4	3	4
Socioeconomic				
Hunting	3	3	4	4
Fishing	3	3	4	4
Fishing Tournaments	5	3	4	3
Commercial Fishing	4	2	4	2
Fishing Floats	3	1	4	3

Table 33: Summary of Alternative Impacts (Continued)

Parameter ¹	Alternative A: No Action	Alternative B: Wildlife Focus	Alternative C: Public Use Focus	Alternative D: Wildlife and Integrated Public Use (Preferred Alternative)
Interpretation and Environmental Education	3	2	5	4
Wildlife Observation and Photography	3	2	5	4
Recreational Boating, Camping, and Other Beach-Related Uses	5	1	4	4
Commercial Guiding and Tours	3	1	2	2
Refuge Access	3	3	4	4
Control of Dogs and Other Domestic Animals	3	2	5	4
Property Taxes	3	2	2	2
Refuge Administration and Operations	1	4	4	5
Cumulative				
Cumulative Impacts	2	4	3	4

1. The scale for summarizing impacts by parameter is as follows: 1= Most negative; 3= Neutral or No Impact; and 5= Most Positive